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10/621,185	07/15/2003	Sang-Deok Kim	51876P361	2348

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EXAMINER	
KENNEDY, JENNIFER M	

ART UNIT	PAPER NUMBER
2812	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/621,185	KIM, SANG-DEOK	
	Examiner	Art Unit	
	Jennifer M. Kennedy	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☒ Interview Summary (PTO-413) Paper No(s). *20040127* .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claim 3 recites that "a upper portion of the sacrificial layer has a higher wet etching rate than a lower portion of the sacrificial layer does". There is no antecedent basis for this in the specification.

The examiner notes that claim 3, directly contradicts the understanding of claim 1, the specification and the Figures as disclosed (see especially, limitation (a) of claim 1, the specification, at page 9, line 26 through page 10, line 5, and Figure 6B). The examiner believes that applicant is trying to claim that a lower portion of the sacrificial layer has a higher wet etching rate than a higher portion of the sacrifice layer does with the height being defined as the distance from the substrate surface. Thus, the lower portion of the sacrificial layer is the portion that is closer to the substrate surface and the higher portion of the sacrificial layer is that portion that is further from the substrate surface. The examiner suggests that this limitation is changed to --a lower portion of the sacrificial layer has a higher wet etching rate than a higher portion of the sacrifice layer--. Examination will be made accordingly.

The disclosure is objected to because of the following informalities: There are numerous places throughout the specification where "sacrifice" should be changed to –

sacrificial--. The examiner points to page 3, line 25, page 4, line 14, page 5, line 20, page 6, line 26, page 9, lines 10, 11, and 26, page 9, line 9, and 26.

On page 3, line 9, the examiner believes that "heightened" should be changed to –increased--.

On page 3, line 16, the examiner believes that "broaden twice" should be changed to –increased two-fold--.

On page 3, line 17, the examiner believes that "at" should be changed to –after--

On page 3, line 27, the examiner believes that –the—should be inserted before "connecting", and –of—should be inserted before " the bottom".

On page 15, line 15, "dep rate" should be replaced with –deposition rate--.

Appropriate correction is required.

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

Claim 1 is objected to because of the following informalities: "step" should be replaced with --steps--, in line 3, of the claim for grammatical correctness. Appropriate correction is required.

Claim 1 is objected to because of the following informalities: --the-- should be inserted before "capacitor", in line 3, of the claim for proper antecedent basis. Appropriate correction is required.

Claim 1 is objected to because of the following informalities: "the substrate" should be changed to –a substrate—, in line 4, of the claim for proper antecedent basis. Appropriate correction is required.

Claim 1 is objected to because of the following informalities: "a" should be replaced with –an--, in line 4, of the claim for grammatical correctness. Appropriate correction is required.

Claim 1 is objected to because of the following informalities: "sacrifice" should be changed to –sacrificial--, in line 7 of the claim for grammatical correctness. Appropriate correction is required.

Claim 1 is objected to because of the following informalities: "in manner of" should be replaced with –by—in line 7, for grammatical correctness. Appropriate correction is required.

Claim 3 is objected to because of the following informalities: "sacrifice" should be changed to –sacrificial--, in line 2 of the claim for grammatical correctness. Appropriate correction is required.

Claim 3 is objected to because of the following informalities: "a upper" should be changed to –an upper--, in line 4 of the claim for grammatical correctness. Appropriate correction is required.

Claim 3 is objected to because of the following informalities: "sacrifice" should be changed to –sacrificial--, in line 4 of the claim for grammatical correctness. Appropriate correction is required.

Claim 3 is objected to because of the following informalities: "sacrifice" should be changed to –sacrificial--, in line 5 of the claim for grammatical correctness. Appropriate correction is required.

Claim 4 is objected to because of the following informalities: "sacrifice" should be changed to –sacrificial--, in line 2 of the claim for grammatical correctness. Appropriate correction is required.

Claim 4 is objected to because of the following informalities: "deposed" should be changed to –deposited--, in line 2 of the claim to correct a typographical error. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation of "forming a sacrificial layer in the height of capacitor on the substrate so that a etch rate becomes lower if it's height becomes higher". The claims are generally narrative and indefinite, failing to conform with current U.S. practice. They appear to be a literal translation into English from a foreign document and are replete with grammatical and idiomatic errors. It is unclear to the examiner what this limitation requires. The examiner notes that it is the sacrificial

material's properties that change the etching rate rather than the height of the sacrificial material. Further, the claim that " a etch rate becomes lower **if**, it's height becomes higher" (emphasis added). The examiner notes that this recitation does not positively recite a process step or add limitations to claim.

With a detailed reading of the specification and the accompanying drawings the examiner believes that applicant is trying to claim that a sacrificial layer is formed, the sacrificial layer has a height that is defined by the distance form the substrate surface, the sacrificial layer has an etching rate that decreases with an increasing height of the sacrificial layer. The examiner suggests replacing this language with –forming a sacrificial layer having a height defined by the distance from a substrate surface, the sacrificial layer having an etching rate that decreases with the increasing height of the sacrificial layer--. Examination will be made accordingly.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Applicant's admitted prior art (see specification pages 1-6, and Figures 1A-5).

Applicant's admitted prior art discloses the method of fabricating a capacitor for a semiconductor device, comprising the steps of forming a sacrificial layer (19, 20) in the

height of the capacitor on the substrate so that an etch rate becomes lower if it's height becomes higher, forming a trench (21) by selectively eliminating the sacrificial layer in a wet etch process, forming a bottom electrode (22) in the trench, eliminating the sacrificial layer (see page 5, lines 5-8), forming a dielectric thin film (23) on the bottom electrode, and forming the top electrode (24) on the dielectric thin film (see especially pages 4-5 of the Applicant's specification).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ooto et al. (U.S. Patent No. 6,215,187) in view of Cho (U.S. Patent No. 6,355,521).

Ooto et al. discloses the method of fabricating a capacitor for a semiconductor device, comprising the steps of forming a sacrificial layer (5e, 5d) in the height of the capacitor on the substrate so that an etch rate becomes lower if it's height becomes higher (see column 10, lines 44-50), forming a trench by selectively eliminating the sacrificial layer in a wet etch process (see column 11, lines 35-45), forming a bottom electrode (8) in the trench, forming a dielectric thin film (1) on the bottom electrode, and forming the top electrode (9) on the dielectric thin film.

Ooto et al. does not disclose the method of eliminating the sacrificial layer. Cho et al. discloses the method of eliminating a sacrificial layer during the method of forming a capacitor (see column 3, lines 30-35, and Figures 1C and 1D). It would have been obvious to one of ordinary skill in the art at the time the invention was made to eliminate the sacrificial layer of Ooto et al. as Cho teaches in order to form a cylindrical structure to increase the effective surface area of the capacitor, and thus increase capacitance (see Cho, column 1, lines 45-50 and column 3, lines 30-35).

In re claim 2, Ooto et al. discloses the method wherein the sacrificial layer is a TEOS layer (5d, 5e, see column 10, lines 28-33 and column 11, lines 25-33).

Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ooto et al. (U.S. Patent No. 6,215,187) and Cho (U.S. Patent No. 6,355,521) in view of Mozumder et al. (U.S. Patent No. 5,546,312).

In re claim 3, Ooto et al. and Cho disclose the method as claimed and rejected above, but do not disclose the method wherein the sacrificial layer is formed in response to a RF power, an O_2 flow, and a spacing between the substrate and the shower head. Mozumder et al. disclose the method of forming a TEOS layer (the material of the sacrificial layer) is formed in response to a RF power, an O_2 flow, and a spacing between the substrate and the shower head (see column 4, lines 20-35). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the TEOS sacrificial layer of the combined Ooto et al. and Cho by the method of Mozumder et al. by controlling the RF power, the O_2 flow, and the spacing between the substrate and the shower head in order to allow for optimal settings that

allow for a uniform deposition rate of TEOS across the wafer and generally meet the tight set of specifications that integrated circuits require (see column 1, lines 25-35, column 2, lines 8-15, and column 4, lines 18-36).

Ooto et al. discloses the method wherein the lower portion of the sacrificial layer has a higher wet etching rate than a higher portion of the sacrificial layer does (see column 10, lines 44-50 and column 11, lines 35-45).

In re claim 4, Ooto et al. discloses the method wherein the sacrificial layer is deposited in a thickness ranging from about 10,000 angstroms to about 25,000 angstroms. The examiner notes that Ooto et al. teaches a sacrificial thickness that is about 8000 angstroms, which the examiner maintains is about 10,000 angstroms.

If for some reason it is believed by applicant that the sacrificial thickness is not disclosed by Ooto et al. the examiner maintains that it would have at least been obvious to form the sacrificial layer of a thickness ranging from about 10,000 angstroms to about 25,000. The selection of the sacrificial layer thickness is obvious because it is a matter of determining optimum process conditions by routine experimentation with a limited number of species of result effective variables. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)(claimed ranges or a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA)

(discovery of optimum value of result effective variable in known process is ordinarily within skill or art) and In re Aller, 105 USPQ 233 (CCPA 1995) (selection of optimum ranges within prior art general conditions is obvious). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the sacrificial layer of a thickness of ranging from about 10,000 angstroms to about 25,000 since a thicker sacrificial layer would allow for a larger surface area of the bottom electrode to be formed upon, thus allowing for a capacitor with greater capacitance.

Note that the specification contains no disclosure of either the critical nature of the claimed thickness or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thickness or upon another variable recited in a claim, the Applicant must show that the chosen sacrificial layer thickness is critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Kennedy whose telephone number is (703) 308-6171. **After February 3, 2003, the examiner can be reached at (571) 272-1672.** The examiner can normally be reached on Mon.-Fri. 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on (703) 308-3325. **After February 3, 2003 the examiner's supervisor can be reached at (571) 272-1679.** The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jennifer M. Kennedy
Patent Examiner
Art Unit 2812